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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/718,413	11/24/2000	Charles Stephen Wiles	1263.1797	1602

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EXAMINER

CARTER, AARON W

ART UNIT PAPER NUMBER

2625

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/718,413

Applicant(s)

WILES ET AL.

Examiner

Aaron W Carter

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15, 17-44 and 46-118 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17-22, 24, 46-50, 52, 58, 59, 61-63, 80, 81, 83-89, 91, 93, 95, 100, 101, 103, 106 and 107 is/are allowed.
- 6) ☒ Claim(s) 1-15, 23, 25-44, 51, 53-57, 60, 64-79, 82, 90, 92, 94, 96-99, 102, 104, 105 and 108-118 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 November 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This action is responsive to papers filed on August 2, 2004.

Response to Amendment

2. In response to applicant's amendment received on August 2, 2004, all requested changes to the specification and claims have been entered. Claims 16 and 45 have been cancelled.

Response to Arguments

3. Applicant's arguments, see Remarks, pages 92-94, filed August 2, 2004, with respect to claims 19, 48, 80, 86 and 100 have been fully considered and are persuasive. The 35 USC 102(b) of rejection of these claims has been withdrawn.
4. Applicant's arguments, see Remarks, pages 82-92, filed August 2, 2004, with respect to the rejection(s) of claim(s) 1-15, 25, 28-44, 53, 56, 57, 60, 64, 66, 68-79, 82, 96-99, 104 and 109-118 under 35 USC 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of USPN 4,982,438 to Usami et al. ("Usami") (already of record) and in view of USPN 6,373,487 to Culbertson et al. ("Culbertson").

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Allowance Withdrawn

5. The indicated allowability of claims 23, 51, 90, 92, 94, 102 and 108 is withdrawn in view of the newly discovered reference(s) to Usami and Culbertson. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 65 and 67 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

As to claims 65 and 67, a statutory product with descriptive material must include a positive recitation of the computer readable medium (MPEP 2106). Please amend claims 65 and 67 to something along the lines of: "A computer program embodied in a computer readable medium..."

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 2, 5-7, 30, 31, 34-36, 55, 56, 64-67, 96, 117 and 118 are rejected under 35 U.S.C. 102(b) as being anticipated by USPN 4,982,438 to Usami et al. ("Usami") (already of record).

As to claim 1, Usami discloses a method of operating an image processing apparatus for processing image data representing images of an object taken from a plurality of different camera positions, the method comprising the steps of:

(a) determining the viewing volume for each camera position (Fig. 5, 6 and 7, wherein the broadest reasonable interpretation of the limitation the presumed existence region corresponds to viewing volume, see also column 4, lines 17-60);

(b) determining the volume bounded by the intersection of the viewing volumes (Fig. 7, wherein the broadest reasonable interpretation of the limitation the common presumed existence region corresponds to volume bounded); and

(c) setting the bounded volume as an initial space for use in deriving a representation of the three-dimensional surface of the object using said images (Figs. 8 and 9 and column 4, line 67 – column 5, line 20).

As to claim 2, Usami discloses a method according to claim 1, further comprising the step of (d) dividing the bounded volume into voxels to form an initial voxel space (Fig. 8 and 9).

As to claim 5, Usami discloses a method according to claim 1, wherein the step of determining the viewing volume for a camera position comprises includes determining the viewing volume using data representing a camera focal point and a camera imaging area for that camera position (Figs. 5 and 7).

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As to claim 6, Usami discloses a method according to claim 5, wherein the step of determining the viewing volume includes projecting straight lines from the focal point through points on the boundary of the imaging area (Figs. 5 and 7).

As to claim 7, Usami discloses a method according to claim 1, wherein the step of defining the intersection of the viewing volumes comprises:

(i) determining an initial intersection of the viewing volumes of first and second camera positions (Fig. 1, elements 101-106 and Fig. 7);

(ii) determining the intersection of that intersection with another viewing volume and setting that intersection as the current intersection (Fig. 1, elements 101-106 and Fig. 7); and

(iii) repeating steps (i) and (ii) until the viewing volumes for all camera positions have been considered (Fig. 1, elements 101-106 and Fig. 7).

As to claim 30, please refer to the rejections made for claim 1 above.

As to claim 31, please refer to the rejections made for claim 2 above.

As to claim 34, please refer to the rejections made for claim 5 above.

As to claim 35, please refer to the rejections made for claim 6 above.

As to claim 36, please refer to the rejections made for claim 7 above.

As to claims 55 and 56, Usami discloses an apparatus according to claim 30, further comprising means for providing a computer storage medium storing or signal carrying data

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defining the initial space or the voxel representation of the three-dimensional object surface (column 1, lines 11-16 and column 3, lines 24-27).

As to claim 64 and 66, Szeliski discloses a storage medium carrying processor implementable instructions for causing processing means to carry out a method in accordance with claim 1 or 30 (column 3, lines 24-27).

As to claims 96, 117 and 118 please refer to the rejections made for claim 1 above.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 3, 4, 8-15, 23, 25-29, 32, 33, 37-44, 51, 53, 54, 57, 60, 68-79, 82, 90, 92, 94, 97-99, 102, 104, 105, 108 and 109-116 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usami in view of USPN 6,373,487 to Culbertson et al. ("Culbertson").

As to claim 3, Usami discloses a method according to claim 2 including an initial voxel space constructed from the bounded volume.

Usami does not disclose expressly any of the other limitations presented in claim 3.

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Culbertson discloses a method of 3D model construction from multiple images at multiple views comprising:

- (e) determining, for each voxel that is not occluded by another voxel, the area corresponding to that voxel in each image in which that voxel is visible (column 5, lines 11-14 and lines 49-53);
- (f) comparing characteristics of each of the image areas corresponding to the same voxel (column 5, lines 53-57, wherein color consistency corresponds to characteristic);
- (g) removing a voxel in response to the characteristics of the image areas corresponding to that voxel being inconsistent (column 5, lines 22-25); and
- (h) repeating steps (e) to (g) until all non-occluded voxels having inconsistent characteristics have been removed (column 6, lines 6-12).

Usami & Culbertson are combinable because they are from the same art of 3D image analysis.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the 3D model construction procedure disclosed by Culbertson with the process of volume bounding disclosed by Usami for deriving a 3D representation of an object.

The suggestion/motivation for doing so would have been that space carving removes the restriction on camera location as well the process disclosed by Culbertson eliminates color inconsistency (Culbertson, column 2, lines 32-33 and column 2, line 65 – column 3, line 5).

Therefore, it would have been obvious to combine Usami with Culbertson to obtain the invention as specified in claim 3.

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As to claim 4, please refer to rejections made for claims 1-3 above.

As to claim 8-15, please refer to rejections made for claims 1-3 and 5-7 above because no new limitations have been presented in claims 8-15 that have not already been addressed.

As to claim 23, the combination of Usami and Culbertson discloses all the limitation of claim 23 as discussed above in the rejection of claims 1, 2, and 3. However the limitation of color space values, which replaces image characteristic in the above claims, is not discussed in the above claims. Culbertson discloses the use of the color space value (column 5, 11-13, color consistency)

As to claim 25, the combination of Usami and Culbertson discloses a method according to claim 4, wherein the step of determining the area corresponding to a voxel in an image comprises projecting the voxel into each image (Culbertson, column 5, lines 49-53).

As to claim 26, the combination of Usami and Culbertson discloses a method according to claim 4, wherein the step of comparing the characteristics of the image areas or regions comprises comparing colors of the image areas or regions (Culbertson, column 5, 11-13, color consistency).

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As to claim 27, the combination of Usami and Culbertson discloses a method according to claim 4, which further comprises outputting a signal carrying data defining the initial space or the voxel representation of the 3-D object surface (Culbertson, Fig. 12).

As to claim 28, the combination of Usami and Culbertson discloses a method according to claim 4, which further comprises providing a computer storage medium storing data defining the initial space or the voxel representation of the 3D object surface (Culbertson, Fig. 12).

As to claim 29, the combination of Usami and Culbertson discloses a method according to claim 4, further comprising generating texture data for rendering onto the representation of the 3D object surfaces (Culbertson, column 5, lines 12-15, wherein color corresponds to texture).

As to claims 32, please refer to the rejections made for claim 3 above.

As to claims 33, please refer to the rejections made for claim 1-3 above.

As to claim 37-44, please refer to rejections made for claims 1-3 and 5-7 above because no new limitations have been presented in claims 37-44 that have not already been addressed.

As to claim 51, please refer to the rejections made for claim 23 above.

As to claim 53, please refer to the rejections made for claim 25 above.

As to claim 54, please refer to the rejections made for claim 26 above.

As to claim 57, please refer to the rejections made for claim 29 above.

As to claim 60, please refer to the rejections made for claim 1 above.

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As to claims 68-79, 82, 90, 92, 94, 97-99, 102, 104, 105, 108-116, please refer to rejections made for claims 1-3, 5-7, 23 and 25-29 above because no new limitation have been presented in the claims that have not already been addressed.

Allowable Subject Matter

11. Claims 17-22, 24, 46-50, 52, 58, 59, 61-63, 80, 81, 83-89, 91, 93, 95, 100, 101, 103, 106 and 107 are allowed.


Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron W Carter whose telephone number is (703) 306-4060. The examiner can normally be reached on 7am - 3:30 am (Mon. - Fri.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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